

# ATCO

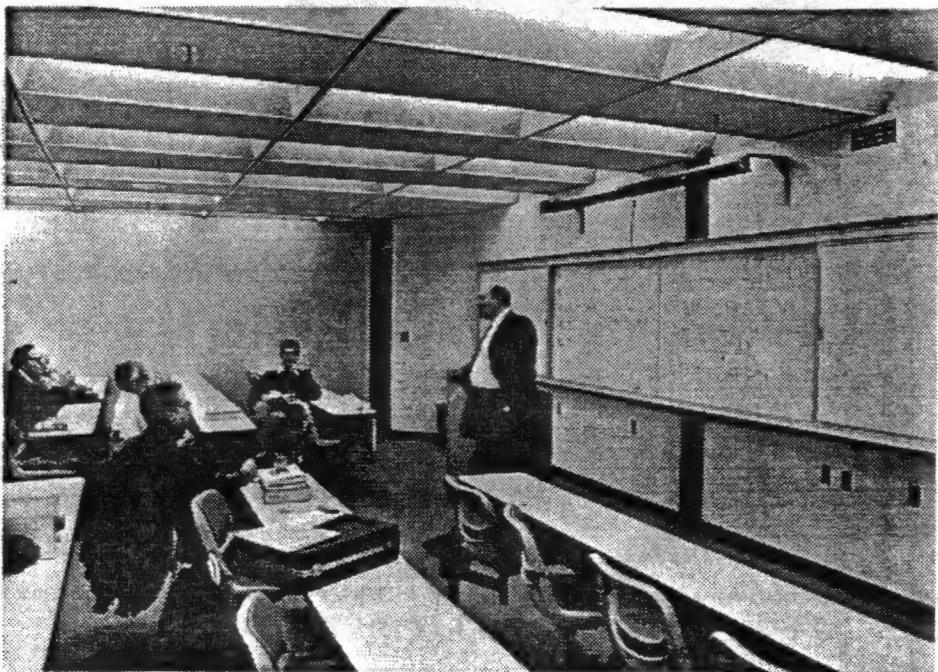
# NEWSLETTER

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VOLUME 7 NUMBER 3

JULY 1990

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ATCO "TECH TALK" - SEE PAGE 2

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The ATCO Newsletter is the official publication of a group of television amateurs known as "AMATEUR TELEVISION IN CENTRAL OHIO" and is published in January, April, July, and October.

Membership in ATCO is open to any FCC licensed radio amateur who has an interest in amateur television.

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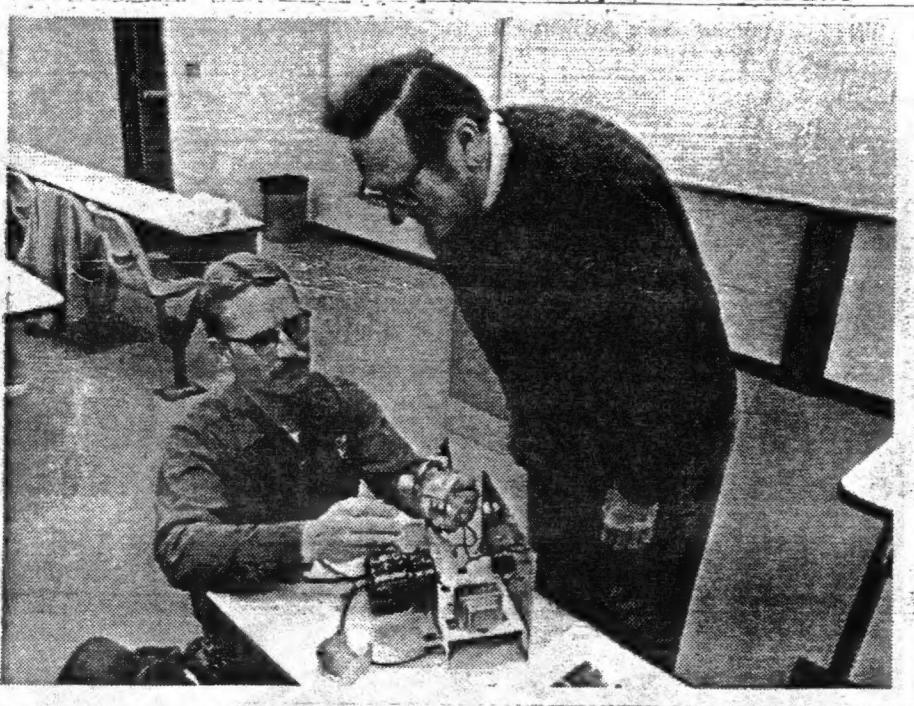
## ATCO "TECH TALK"

Eleven ATCO members met on Friday 6 April at 7:30 p.m. at the DeVry Institute of Technology for our first event of 1990. Those present were John, WBCCW; Bill, W8DMR; Rick, WA3DDO; Foster, W8EHW; John, WA8EOY; Warren, KA8GZQ; Bob, WM8P; Dick, WBRVH; Phil, WA8TTE; Bill, WB8URI; and Tom, KABZNY.

Talks were presented by the following ATVers on the subjects indicated below:

- WA8EOY - "Preamp Up and Preamp Down"
- WB8URI - "1280 MHz Tube RF Amplifier"
- WM8P - "1200 MHz Repeater" and "439 MHz PLL Transmitter"
- WBRVH - "1200 MHz Exciter"
- KABZNY - "70 cm KW!"

Thanks to Tom, KABZNY, for photo on the cover page and the picture of Dick, WBRVH, and Bill, WB8URI, shown below.



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## \*\*\*\*\* SPACE SHUTTLE ATLANTIS

Space Shuttle Atlantis is scheduled for a five day mission to be launched on 1 November 1990. Marine Corps Lt. Col. Ken Cameron, KB5AWP, the pilot, has been authorized to operate voice, packet, and slow scan and fast scan amateur television. The flight will center the majority of ham radio operations on the amateur 2-meter band, and the equipment is undergoing final testing at the Johnson Space Center in Houston, Texas. The orbital track of the mission will be at an inclination of approximately 28.5 degrees. (Submitted by Perry, WB8OTH.)

## ATV-FM COMPATIBILITY

(The following article was submitted by Bill, W8DMR, who assisted WBJRL in its preparation. Thanks to the Repeater Coordinators' Newsletter and the ARRL. - Editor.)

In general ATV and FM in the same region are not co-channel compatible as some would have us believe. Depending on HAAT (Height Above Average Terrain) of the two sites in question (ATV RX and FM TX) a minimum of 50 or 60 miles must be maintained. At distances of 10 miles or more, with the exception of the color subcarrier ( $\pm 100$  kHz or so) the aural carrier (subcarrier,  $\pm 50$  kHz) and visual carrier ( $\pm 175$  kHz or so) the FM won't even know that the TV transmitter is there. To understand this one must look at the "Spectral Power Distribution" of the TV signal compared to FM. It is measured in watts per hertz or, to use more practical units, W/kHz. Let's assume a 10-watt average power ATV transmitter and black burst video (maximum average power) and compare it to a 10-watt FM transmitter  $\pm 5$  kHz deviation. The bandwidth of the TV signal is 6000 kHz and the FM is 18 kHz (3 kHz audio BW). The power per kilohertz is then: PAVG/BW kHz = 10 W/6000 kHz = 1.67 mW/kHz (ATV) and 10FM/18 = 555 mW/kHz (FM). There is a difference of much more than two orders of magnitude! Therefore, the TV signal presents considerably less than one percent of the interference to the FM than the FM does to the TV, based solely on power.

With further analysis, the spectral distribution of the TV signal is not uniform. The visual carrier is 10 watts. This makes sync tips 13.3 watts. And the first 5 sync sidebands is 1.5 watts. Since these sync sidebands are both timed and non-sinusoidal, they account for only about 8% of the sideband power or about 0.4 watts.

If an aural subcarrier is used, it accounts for 1% or less of the sideband power (1.8% max). These values are approximate and assume correct sync and blanking levels. However, from these approximations one can see that of the total power density, only about 5% is sideband power (4% without aural subcarrier). Thus the real spectral power density is:  $0.5W/6000 = 83.3$  mW/kHz! This is eliminating only the visual carrier from consideration.

Therefore, in practice there is not a difference of

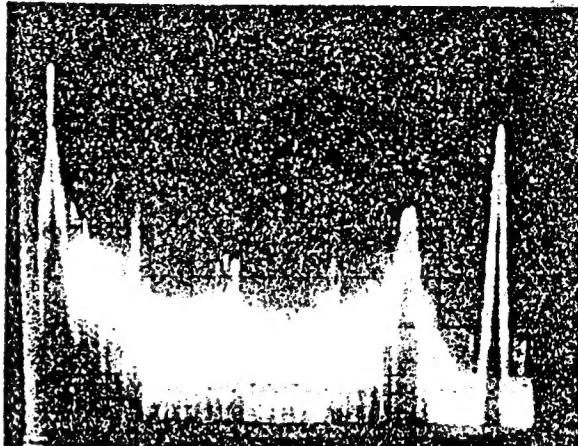


Fig. 1 — 500 kHz/div horizontal; 10 dB/div vertical; 10 kHz BW; visual carrier at 421.25 MHz

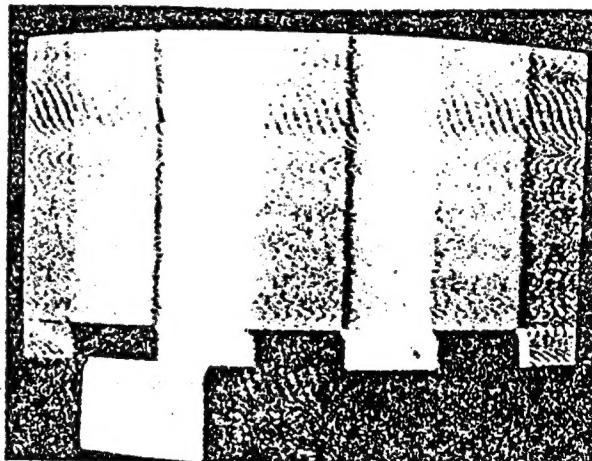


Fig. 2 — Off air with 40 dB picture carrier to Interference ratio.

two orders of magnitude, but nearly five! This is a more realistic figure and represents nearly -50 dB less interference to the FM than a 10-watt CW (or FM) carrier to the FM receiver in the original premise. In fact, at 10 miles the FM receiver will suffer only a slight to moderate rise in its noise floor, depending on where it is in the upper visual sideband. In Fig. 1 it is clearly evident that, except

(continued on page 6)

## RESISTIVITY AND DIELECTRIC CONSTANTS OF MATERIALS

By John, WA8E0Y

With the trend of ATVers building transmitters, receivers, and antennas for the higher frequencies, I believe a review of material constants might be a helpful reminder. Listed below are just the more common materials.

TABLE 1 - Resistivity of Materials

Material	Resistivity Compared to Copper (annealed) 1.00
Aluminum.....	1.60
Brass.....	3.70-4.90
Copper (hard-drawn).....	1.03
Gold.....	1.40
Lead.....	12.80
Nickel.....	5.01
Phosphor bronze.....	2.80-5.40
Silver.....	0.94
Steel.....	7.60-12.70
Tin.....	6.70
Zinc.....	3.40
Cadmium.....	4.40

TABLE 2 - Dielectric Constants and Breakdown Voltages Compared to Air (1.00)

Material	Dielectric Constant @ 1 MHz	Puncture Voltage (Volts per .001 in.)
Air.....	1.0 .....	240
Bakelite.....	4.4-5.4 .....	300
Bakelite, mica filled...	4.7 .....	350
Fiber.....	5.0-7.5 .....	150-180
Formica.....	4.6-4.9 .....	450
Glass, Pyrex.....	4.8 .....	335
Mica.....	5.4 .....	3800-5600
Plexiglas.....	2.8 .....	990
Polyethylene.....	2.3 .....	1200
Polystyrene.....	2.6 .....	600
Porcelain.....	5.1-5.9 .....	40-100
Teflon.....	2.1 .....	1000-2000

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W8AER WORKS W8RVH ON 1296 MHz

Dave sent us a note to let us know that he was seen in New Carlisle by Dick, W8RVH, on 25 June. Dave says the contact was made on his tower mounted rig with an output of five watts.

## ATV NEWS ITEMS

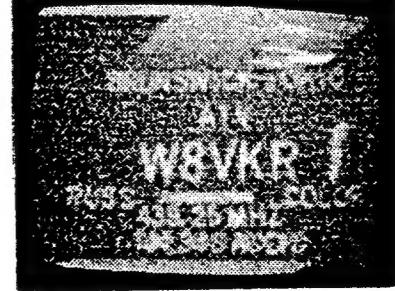
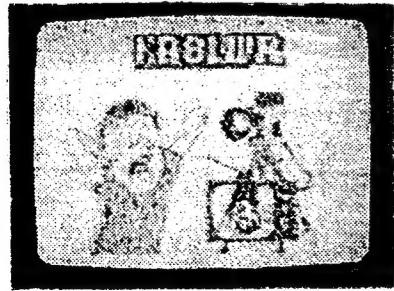
(The following items of interest to ATVers were compiled from reports submitted by Bill, WB8URI.)

NEW STATIONS ON 1200 MHz - Two new stations capable of transmitting FM video are KABWEX and W8AER. Phil has successfully frequency locked his TVG 12A and is running about five watts on 1280 MHz. Dave has mounted his five watt rig at the antenna to eliminate feed line losses.

TWO NEW STATES FOR WB8URI - On 4 May 1990, Bill worked NBKKY, Pete, in Mineral Wells, West Virginia, (near Parkersburg) and received a P2 report. On 6 June, Bill got a P2 from N4MEY, Curt, located in Nashville, Tennessee. Both stations were worked on 439.25 MHz.

DAYTON ATV ACTIVITY ON INCREASE - Activity has increased on the Dayton ATV repeater since the Dayton Hamfest. Under enhanced conditions, WBBI/R can be seen in the Columbus area. The station is vertically polarized on its output frequency of 426.25 MHz. Identifying on 147.45 MHz will bring up the WBBI/R test pattern.

BAND OPENINGS FREQUENT - In the past couple of months a number of band opening have occurred. The photos on this page were taken by Bill, WB8URI. All stations were worked in May or June of this year. Stations worked but not recorded include the following: K9LZJ, KB9BFB, K9AWS, and N9INK (all through the Indianapolis vertically polarized ATV repeater K9LPW/R transmitting on 425.25 MHz), and W8YOS in Cleveland. All reports were P5 both ways. For your information, ATVers in Cleveland; Erie, Pennsylvania; and Buffalo, New York, are horizontally polarized on 2-meters.



## ATV-FM COMPATIBILITY

(continued from page 3)

within about  $\pm 300$  kHz of the visual carrier, all sideband information is  $-30$  dB or more below the visual carrier. The worst case is the color info at about  $-30$  dB. The aural is  $-10$  dB and is not a true subcarrier. It is a 4-watt FM transmitter to match the 40-watt visual. In a true subcarrier signal the highest level the aural can have without adverse effect on the video is  $-20$  dB or so.

In this particular case the shared band is 442-444 MHz. This visual signal at 439.25 MHz will almost universally be ATV simplex or repeater input. In the case of FM it may be repeater input or output depending on which part of the country it is in.

In the case of FM to TV interference, one can use the above figures in reverse and see that the interference caused will be substantially greater. These figures are empirically verifiable.

Note the carrier about 6 dB above the video sideband 3.85 cm from the left in Fig. 1. This is an FM carrier approximately 40 dB below the visual carrier. It produces a very noticeable moire (herringbone) pattern in the picture. See Fig. 2. (Figs. 1 and 2 were taken within seconds of each other).

As the interfering signal gets stronger the picture gets worse by a logarithmic proportion. At  $-30$  dB one can tell what the picture is supposed to be but most detail is lost. At  $-25$  dB one can say that "Yes, this is supposed to be color bars but..." At  $-23$  and less the picture is, for all practical purposes, obliterated. If the detector in the receiver is a synchronous or PLL type, it will try and lock on to the interference and bye-bye video. (That's one reason why the aural carrier must be 7 or more dB below the visual carrier).

In effect, the FM signal appears as a sideband with no timing reference to sync or burst.

This effect is essentially the same regardless of where it falls from 438 MHz to 443.65 MHz. From 443.65 to 443.9 MHz it will interfere with the sound. There is a dip from about 443.5 to 443.65 MHz where a  $-40$  dB signal won't interfere noticeably, but  $-30$  dB will. It also means a 10-milliwatt signal will have the same effect shown in Fig. 2 on a 100-watt ATV signal if it is at the same distance, height and antenna gain as the 100-watt ATV signal! (100 watt  $-40$  dB = 10 mW)!

### Solutions:

1) Wherever possible the ATV should be horizontally polarized which will give a minimum 20 dB cross polarization isolation between FM and ATV. It will probably be more, but due to polarization field twist and multipath (especially in large metropolitan areas) 20 dB is a reliable figure.

2) Again, wherever possible links and repeater (inputs especially) should be assigned outside the 438-444 MHz area. ATV groups should offer to buy links and repeaters that do cause significant interference and do so diplomatically.

We owe it to ourselves and the public at large to reach and make amicable and peaceful solutions to problems as they arise. With the proliferation of home video equipment and the rapidly growing interest in the ATV mode I fear this may not be the case.

As purported ambassadors of international good will, we need to learn how to sit down among ourselves, put egos aside, get out some good solid facts and come to some agreements about what is best for all concerned, especially the public which we are also mandated to serve. I hope I have provided some of those facts in this paper.

Finally, I must comment on the five points made by WAØLHK and NØEUH.

1) Maintain at least a 30-mile FM to ATV RX separation.

For the FM operator this is more than adequate. For the ATVer it is disastrous. More so if it is an input to an FM repeater, since the user can easily be 30 miles from the repeater and right under the ATV receiver. 60 miles is marginal but depends on HAAT and terrain.

2) Use vestigial sideband filter on RX. This is simply good engineering practice and will prevent all off channel signals from interfering and causing front end overload and intermod. It will do nothing to an "in Channel" signal.

3) Use no more ERP than is necessary on the FM repeater transmitter. Mandated by Part 97 we are all obliged to do this on all modes and frequencies.

4) Make sure FM links in the 439 MHz band use directional antennas and the lowest power to maintain a good link. They should also use cross polarization and be located outside the region wherever possible.

(continued on page 7)

## ATV-FM COMPATIBILITY

(continued from page 3)

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(continued on page 7)

## **ATV-FM COMPATIBILITY**

(continued from page 6)

Example: There was a 5-watt link in Sioux City, Iowa, on 442.33 MHz, 90 airline miles from the ATV machine in Omaha, Nebraska. The herringbone on weak ATV signals especially was noticeable. With a bit of diplomacy and phone calls the link changed polarization and the interference went away.

5) Stay  $\pm 200$  kHz from the following frequencies; 442.83 MHz color burst and 443.75 MHz sound carriers. Since these two areas contain the most energy except for the visual carrier they are the only two likely to interfere with an FM system's input, and less likely its output. Assume a garden variety 10-watt ATV transmitter using subcarrier sound. This aural carrier will of necessity be -20 dB (below the video carrier) or 100 milliwatts or less. Again, who gets the interference? These frequencies should be coordinated with the ATV receiver site and should not be used for FM activity.

From the above figures it should be obvious that the frequencies from 438 to 444.0 MHz should be included, not just the burst and audio. As a result of tests made here 443.9 MHz and up are not a problem. One watt at two miles from the ATV RX on 443.9 MHz (omni, 0 dB gain) showed barely discernible presence on the aural of the TV. 443.875 MHz was noticeable and 443.85 MHz caused serious degradation.

To summarize, QRM between co-channel ATV and FM is 98% unilateral. Such sharing in a region is undesirable and should be avoided wherever possible. Where such sharing is a fact, all parties, ATVers, FM operators and the Frequency Coordinator should try and reach an equitable solution where problems exist.

As a footnote: SSB power density is: Pwr ssb/BW kHz =  $10/3$  kHz = 3.3 W/kHz. — John Gebuhr, WBØCMC

### **\*\*\*\*\* EDITOR'S NOTE**

Technical articles appearing in this issue of the ATCO Newsletter have not been edited for technical content. Readers having questions or comments concerning such articles should contact the authors. Please do not contact the ATCO Newsletter Editor.

### **\*\*\*\*\* NEWSLETTER PUBLICATION POLICY**

For the past three years, the ATCO Newsletter has been published regularly as stated at the bottom of page one. As you know, we rely on you to submit material for publication.

Our immediate plans call for us to continue as a quarterly publication, but this can be done only with your cooperation. In the event that sufficient material is not available to your editor to publish a newsletter which meets the quality and quantity standards on the specified publication date, publication and distribution will be delayed.

Within each calendar year, it is planned that four issues of the ATCO Newsletter will be mailed to our members. If less than four issues of the newsletter are published, the period of membership will be extended accordingly.

### **\*\*\*\*\* OUR CONTRIBUTORS**

Thanks to the following ATCO ATVers for their contributions to the July 1990 issue of the ATCO Newsletter: Perry, WB8OTH; John, WA8EOY; Bill, W8DMR; and Bill, WB8URI

## ATCO MEMBERS AS OF 30 JUN 1990

KBAEH	Wilbur Wollerman....	1672 Rosehill Rd.....	Reynoldsburg	43068
WBAER	David Sears.....	1678 Kaiser Dr.....	Reynoldsburg	43068
KBAOH	Charles Tucker.....	1500 E. Leffel Lane.....	Springfield	45505
KB2ARL	Dave DiGiuseppe.....	5685-B Hibernia Dr.....	Columbus	43232
WABATF	Emmett McDonald....	14120 Flintridge Rd. SE.....	Glenford	43739
W9AZO	Jim Walter.....	2662 St.Rt. 39 NW RD#3.....	Mansfield	44903
KB8BIY	Bob Shaw.....	59 Parkview Ave.....	Westerville	43081
WB8JN	Gene Kirby.....	13613 U.S. 36.....	Marysville	43040
WB8CW	John Ferrell.....	3722 Wagner Court.....	Grove City	43123
NBCYY	Blaire Standley.....	721 West North St.....	Springfield	45504
WB8DMR	William Parker.....	2738 Floribunda Dr.....	Columbus	43209
WA3DTQ	Rick White.....	5314 Grosbeak Glen.....	Orient	43146
WB8HW	Foster Warren.....	124 East Clark St.....	North Hampton	45349
WA8E0Y	John Schlaechter....	3199 Lewis Rd.....	Columbus	43207
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N8FFD	Edward Hauff.....	2716 Columbus Ave.....	Columbus	43209
KA8GZQ	Warren Duemmel.....	3488 Derbyshire Dr.....	Hilliard	43026
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KBHVA	Guy Cunningham, Jr.....	31 Birchfield St.....	Plymouth	44865
KBISM	Steve Iacono.....	1075 Virginia Ave.....	Columbus	43212
K8JBY	Fred Yost.....	330 Dellfield Way.....	Gahanna	43230
N8KCB	Chris Morris.....	3181 Gerbert Rd.....	Columbus	43224
WA8KGQ	Dale Waymire.....	225 Riffle Ave.....	Greenville	45331
N8LEP	Patricia Parker.....	2738 Floribunda Drive.....	Columbus	43209
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WD8BOT	Tom Camm.....	1267 Arkwood Ave.....	Columbus	43227
WB8BTH	Perry Yantis.....	1850 Lisle Ave.....	Obetz	43207
WM8PF	Bob Mills.....	6834 Halligan Ave. East..	Worthington	43085
KE8FPN	James Easley.....	1507 Michigan Ave.....	Columbus	43201
WA8RMC	Arthur Towslee.....	180 Fairdale Ave.....	Westerville	43081
WA8RUT	Ken Morris.....	3181 Gerbert Rd.....	Columbus	43224
W8RVH	Richard Goode.....	9391 Ballentine Rd.....	New Carlisle	45344
WA8TTE	Phil Morrison.....	154 Llewellyn Ave.....	Westerville	43081
WB8TV	Bob Dye.....	6118 Sedgwick Rd.....	Columbus	43235
WB8UGV	Bruce Jaquish.....	4817 W. Arlington Park.....	Fort Wayne, IN	46835
WB8BURI	William Heiden.....	4435 Kaufman Rd.....	Plain City	43064
W8VSY	Jack Schermund.....	401 North Main St.....	West Milton	45383
KA8WEX	Phil Hardman.....	949 Oakwood Ave.....	Columbus	43206
KA8ZNY	Tom Taft.....	386 Cherry St.....	Groveport	43125
KA8ZPF	Johnny Camm.....	1267 Arkwood Ave.....	Columbus	43227

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## ATCO FINANCIAL STATEMENT

### CASH BALANCE:

As of 28 March 1990..... \$468.64

### RECEIPTS:

Dues..... \$ 30.00

Total receipts..... \$498.64

### EXPENDITURES:

Printing charges for April 1990 ATCO Newsletter..... \$ 36.42

Postage for April 1990 ATCO Newsletter..... 8.00

Misc. costs incidental to publication of newsletter.. 23.55

Total expenditures..... \$ 67.97

### SUMMARY:

Cash Balance as of 28 March 1990..... \$468.64

Receipts..... 30.00

Expenditures..... -67.97

Balance as of 29 June 1990..... \$430.67

The above financial report was prepared as of 29 June 1990 by  
Warren G. Duemmel, KA8GZQ, Acting ATCO Treasurer.

# ANNOUNCING!

THE UNION COUNTY AMATEUR RADIO CLUB

PROUDLY PRESENTS

# MARYSVILLE HAMFEST

and

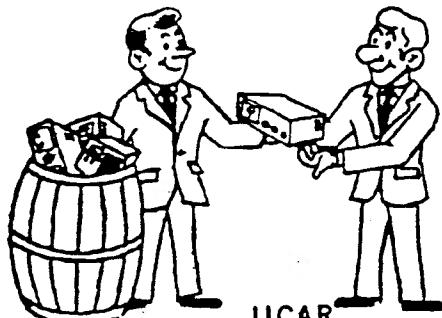
COMPUTER SHOW

Saturday Night and  
**SUNDAY**

**August 26**

RAIN OR SHINE!

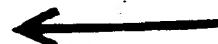
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HUGE  
SWAP  
AREA



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ATCO NEWSLETTER  
c/o Warren G. Duemmel  
3488 Derbyshire Drive  
Hilliard, Ohio 43026

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Editor: Warren, KA8GZQ